

CLAIMS

WHAT IS CLAIMED:

1. A method, comprising:

processing at least one semiconductor device;

acquiring metrology data from said processed semiconductor device;

performing a field-to-field metrology analysis based upon said metrology data; and

performing residual-error analysis based upon said field-to-field analysis.

2. The method described in claim 1, further comprising processing said semiconductor device in a subsequent manufacturing process based upon said residual-error analysis.

3. The method described in claim 1, wherein processing at least one semiconductor device further comprises processing semiconductor wafers.

4. The method described in claim 1, wherein acquiring metrology data from said processed semiconductor device further comprises acquiring field-to-field metrology data analysis.

5. The method described in claim 1, wherein performing the field-to-field metrology analysis comprises:

acquiring overlay error data from at least one exposure field on each processed wafer;

calculating overlay errors for said exposure field based upon said overlay error; and

generating a set of field-mean error data.

6. The method described in claim 5, wherein calculating overlay errors for said exposure field comprises calculating at least one misregistration error.

5 7. The method described in claim 5, wherein calculating overlay errors for said exposure field comprises calculating at least one misalignment error.

8. The method described in claim 5, wherein performing residual-error analysis comprises:

10 generating wafer-mean error data;

comparing said wafer-mean error data to said field-mean error to calculate a difference between said wafer-mean error and said field-mean error data;

determining whether a significant residual error exists based upon said comparison of said wafer-mean error and said field-mean error data; and

15 using said wafer-mean error to perform manufacturing adjustments in response to a determination that significant residual error does not exist.

9. The method described in claim 8, further comprising:

calculating at least one field compensation parameter for at least one wafer-level adjustment in response to a determination that significant residual error exists;

and

performing at least one wafer-level adjustment to compensate for at least one field-level error.

25 10. The method described in claim 8, further comprising:

calculating at least one field compensation parameter for at least one field-level
adjustment in response to a determination that significant residual error exists;
and
performing at least one field-level adjustment to compensate for at least one field-
5 level error.

11. A system, comprising:

a computer system;

a manufacturing model coupled with said computer system, said manufacturing model
10 being capable of generating and modifying at least one control input parameter
signal;

a machine interface coupled with said manufacturing model and said computer
system, said machine interface being capable of receiving process data from
said manufacturing model and said computer system;

15 a processing tool coupled with said machine interface, said processing tool being
capable of receiving at least one control input parameter signal from said
machine interface and performing a manufacturing process;

a metrology tool coupled with said processing tool, said metrology tool being capable
of acquiring field-level metrology data; and

20 a metrology data processing unit coupled with said metrology tool and said processing
tool, said metrology data processing unit being capable of organizing and
analyzing said acquired field-level data and calculating at least one
manufacturing error for generating modification data.

12. The system of claim 11, wherein said computer system is capable of generating field-level compensation modification data based on said manufacturing error for modifying at least one manufacturing parameter.

5 13. The system of claim 12, wherein said manufacturing model is capable of modifying said manufacturing parameter in response to said field-level compensation modification data.

10 14. The system of claim 13, wherein said processing tool is further capable of performing field-level manufacturing process.

15 15. An apparatus, comprising:

means for processing at least one semiconductor device;

means for acquiring metrology data from said processed semiconductor device;

means for performing a field-to-field metrology analysis based upon said metrology data; and

means for performing residual-error analysis based upon said field-to-field analysis.

20 16. A computer readable program storage device encoded with instructions that, when executed by a computer, performs a method, comprising:

processing at least one semiconductor device;

acquiring metrology data from said processed semiconductor device;

performing a field-to-field metrology analysis based upon said metrology data; and

performing residual-error analysis based upon said field-to-field analysis.

17. The computer readable program storage device encoded with instructions that, when executed by a computer, performs the method described in claim 16, further comprising processing said semiconductor wafer in a subsequent manufacturing process based upon said residual-error analysis.

5

18. The computer readable program storage device encoded with instructions that, when executed by a computer, performs the method described in claim 16, wherein processing at least one semiconductor device further comprises processing semiconductor wafers.

10

19. The computer readable program storage device encoded with instructions that, when executed by a computer, performs the method described in claim 16, wherein acquiring metrology data from said processed semiconductor device further comprises acquiring field-to-field metrology data.

15

20. The computer readable program storage device encoded with instructions that, when executed by a computer, performs the method described in claim 16, wherein performing the field-to-field metrology analysis comprises:

acquiring overlay error data from at least one exposure field on each processed wafer;
calculating overlay errors for said exposure field based upon said overlay error; and
generating a set of field-mean error data.

20

21. The computer readable program storage device encoded with instructions that, when executed by a computer, performs the method described in claim 20, wherein

calculating overlay errors for said exposure field comprises calculating at least one misregistration error.

22. The computer readable program storage device encoded with instructions that, when executed by a computer, performs the method described in claim 20, wherein calculating overlay errors for said exposure field comprises calculating at least one misalignment error.

23. The computer readable program storage device encoded with instructions that, when executed by a computer, performs the method described in claim 20, wherein performing residual-error analysis comprises:

generating wafer-mean error data;

comparing said wafer-mean error data to said field-mean error to calculate a difference between said wafer-mean error and said field-mean error data;

determining whether a significant residual error exists based upon said comparison of said wafer-mean error and said field-mean error data; and

using said wafer-mean error to perform manufacturing adjustments in response to a determination that significant residual error does not exist.

24. The computer readable program storage device encoded with instructions that, when executed by a computer, performs the method described in claim 23, further comprising:

calculating at least one field compensation parameter for at least one wafer-level adjustment in response to a determination that significant residual error exists;

and

performing at least one wafer-level adjustment to compensate for at least one field-level error.

25. The computer readable program storage device encoded with instructions that,
5 when executed by a computer, performs the method described in claim 23, further comprising:

calculating at least one field compensation parameter for at least one field-level adjustment in response to a determination that significant residual error exists;

and

performing at least one field-level adjustment to compensate for at least one field-level error.